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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Method for Joining Separate Carpet Members

We, THE DOW CHEMICAL COMPANY, a Corporation organized and existing under the Laws of the State of Delaware, United States of America, of Midland, County of Midland, State of Michigan, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a method for joining separate carpet members in edge-to-edge relationship to form a unitary carpet structure and to carpets thus produced.

Carpeting is normally manufactured in strips of various widths, and when wall-to-wall carpeting is installed pieces of carpeting usually have to be joined to provide a continuous carpet. The most common method which has been employed for joining separate pieces of carpeting is to sew them together. This method has been valued for its ability to produce a joint or seam of sufficient strength to resist the stretching forces applied when installing wall-to-wall carpeting. However, the method is laborious, time-consuming, and the joint thus produced is usually objectionably discernible.

Carpets having a latex coating on the back have been joined by the use of a rather loose woven tape sufficiently wide to join two edges of opposing carpet pieces. In this method of joining carpet pieces, the tape is laid over the joint, and a suitable adhesive is brushed over the tape so that it literally becomes saturated with the adhesive. Either air drying or forced drying of the adhesive is then necessary before the carpet can be turned over and installed in place. In addition to the inconvenience of this joining method, frequently the adhesive will seep through onto the face of the carpet. Removal of such adhesive on and embedded in the pile face of carpeting is exceedingly difficult but necessary for the sake of appearance.

The present invention accordingly provides a fast, efficient and convenient method for effectively joining separate carpet members in an edge-to-edge or side-by-side relationship to form a unitary carpet structure. The method of the invention comprises placing a heat sealable tape having a layer of a polymer of a monolefinic aliphatic olefin monomer having from 2 to 8 carbon atoms upon the back and spanning the juncture of the carpet members and subsequently bonding the tape to the carpeting by the application of heat and pressure.

By the practice of the invention, separate carpet members can be permanently and securely joined together in a highly efficient manner. The use of messy adhesives and the associated drying times are obviated by the method of the present invention. Furthermore, soiling or staining of the facing the carpet can also be avoided. Of particular benefit in the practice of the invention is the tendency of the tape to become unitary with the back of the carpeting. Moreover, an exceptionally smooth, level surface at the joint can be produced so that joints in installed carpeting are practically undetectable.

Of the heat sealable tapes which may be used in the process of the invention, particularly effective are those having a layer of a polymer containing at least 50 weight percent polymerized ethylene in the polymer molecule. Resistance of the joint or seam to stretching forces can be improved, in accordance with the invention if such a heat sealable tape has, in addition, a layer of reinforcing filaments, which may, if desired, be encapsulated in the polymer.

Conveniently, a portable electrically heated iron can be used for plying over the tape to effect the union or seam between the

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carpet members and the tape. This means is especially adaptable and effective when it is desired to join carpet pieces at the location where the carpet is to be installed. It is preferable that the heated surface of the iron or similar instrument be at least as wide as the tape but this is not essential.

The temperature of the heated surface should be at least that of the softening temperature of the heat sealable tape. By way of example, when polyethylene or ethylene polymers of the type herein described are utilized, the temperature of the heated surface should be at least about 250° F. (121° C). Generally, temperatures between about 300° F. (149° C.) and 450° F. (232° C.) are beneficially employed.

Only enough pressure need be applied over the tape when joining the carpet members to provide generally uniform contact of the tape with the carpet surfaces. This generally produces a carpet with, for all practical purposes, a seamless appearance. Excessive pressures which tend to permanently crush the face yarns of the carpet or tend to force any of the tape material through onto the face of the carpet should be avoided.

The time necessary to effect the bond or joinder depends in part on the temperature of and pressure applied to the heated surface that is plyed over the tape. As the temperature and pressure are increased the required time decreases. Ordinarily, with, for example, an ethylene polymer coated tape and a heated hand operated iron at a temperature of about 400° F. (204° C.) and moderate hand pressure, an excellent joinder can be produced almost instantaneously.

If desirable, a release agent can be applied on the side to which the heat and pressure are applied to eliminate any tendency of the tape to stick to the heated surface. Advantageously, a regenerated cellulose sheet can be used for the purpose. Thus the release agent, e.g. regenerated cellulose, can be laid over the tape and the heated surface plyed over the top of the release agent. Subsequently, the release agent can be readily stripped from the tape, especially if lightly sponged with water.

The width of the tape is not critical. Widths from 1/2 to 8 inches or so may be desirable for certain applications, although tape having a width of from 3 to 4 inches is preferred for reasons of economy, ease of application, and strength of joint to resist stretching.

The method of the present application is of particular advantage when employed with those carpets which have a backing of a polyolefin such as polyethylene. It is even more advantage with those carpets which are backed with a copolymer of ethylene with another monoethylenically unsaturated monomer.

Non-aromatic olefin polymer e.g. polyethylene, film and other articles, as is well known, commonly have a smooth and sleek, relatively slippery and wax-like surface which is poorly adapted to provide for suitable adhesion or anchorage of applied materials by mere physical attachment. In addition, the relatively inert chemical nature of polyethylene and the like non-aromatic hydrocarbon olefin polymers resist the efficient attachment of most materials by chemical interlinkage or bonding. Thus, serious difficulties have been encountered in sufficiently joining carpets that have been coated or backed with ethylene polymers and related olefin polymers. Accordingly, the present invention permits the efficient and effective joining in side-by-side relationship of pieces of carpet structures that have applied to the back-side thereof a polymer of a mono olefinic aliphatic olefin monomer having from 2 to 8 carbon atoms such as polymers containing 50 weight percent ethylene in the polymer molecule. For joining such carpet structures, the heat sealable tape can be of any material which is compatible with and will form a permanent bond with the polymer employed for the carpet backing. However, the most satisfactory results are usually obtained when the polymer on the carpet members is the same as the polymer on the tape.

The invention is illustrated in the accompanying drawing, in which:

Figure 1 perspectively depicts a tape useful for joining the carpet members in accordance with the invention;

Figure 2 illustrates the tape of Figure 1 in fragmentary cross-section; and,

Figure 3 perspectively depicts two carpet members having a polyolefin backing being joined in accordance with the method of the invention.

With initial reference to Figures 1 and 2, there is illustrated a tape structure especially useful in the practice of the invention, generally designated by the reference numeral 10.

Figure 2 shows a preferred embodiment of the tape of the invention wherein a core of a layer of reinforcing filaments 11 is encapsulated in an olefin polymer sheath 14.

In Figure 1 is shown a layer of reinforcing filaments consisting of what might be referred to as warp filaments 12 which run essentially parallel to the longitudinal axis of the tape, and of weft filaments 13 which run essentially perpendicular to warp filaments 12.

The core 11 of the tape need not be of the particular design illustrated in Figure 1. Indeed a wide variety of weaves and combinations of weaves can be utilized that will provide a relatively thin fabric for the purpose. It is desirable that the core have good transverse tensile properties in order to resist the normal forces that will be exerted on the joint when the carpet is installed without rupturing of or allowing the joint to separate.

Ordinarily, a relatively wide mesh core is preferred as this allows the sheath polymer to be flowed into and fill the voids of the core during the making of the tape and affords a more integral union between the core and sheath. Instead of a core of a woven "fabric" a core of a non-woven fabric can also be employed in the tapes utilized in the invention. As will the woven cores, these non-woven cores should exhibit satisfactory transverse properties and have enough porosity to effectuate a good unity with the olefin polymer sheath.

The material used for the filaments of the core fabric includes cotton, rayon, jute, nylon, acrylonitrile polymers, polyesters, polyolefins and glass.

The polyethylene or other non-aromatic hydrocarbon polyolefin that is employed as the sheath 14 of the preferred tapes utilized in the practice of the invention are those of the normally solid and film-forming nature. Beneficially, these are polymers prepared by polymerization of 2 to 8 carbon atom monoolefinic aliphatic olefin monomers, such as ethylene, propylene, butylene and so forth (including polymerizable mixtures thereof), and particularly the α-unsaturated olefin monomers of the type described.

In addition to homopolymers of the olefin monomers (or copolymers of two or more olefin monomers), copolymers of at least about 50 weight percent of a 2 to 8 carbon atom aliphatic olefin monomer with another ethylenically unsaturated monomer copolymerizable therewith can be employed in the sheath polymer. For example copolymers of at least about 50 weight percent ethylene with a monomer such as methyl acrylate, methyl methacrylate, ethyl acrylate or vinyl acetate can be utilized.

In some instances it may be suitable to coat only one side of the core fabric of the tape with the olefin polymer. When using a tape with only one side coated it is preferable that the coated side be placed against the carpet when joining the carpet members. However, in either case, whether coating both sides or only one side, it is desirable that the polymeric coating extend beyond the edges of the core fabric. Thus, when both sides are coated, the core is for all practical purposes encapsulated with the polymer. Beneficially, a tape is used wherein the core fabric is totally encapsulated in the polymer. This obviates any loss in strength of the core fabric through attack by moisture, mildew and the like.

The olefin polymer coating or sheath may be applied over the core fabric by any conventional technique including applying it in a molten state by extrusion, spraying, dipping, roll coating, and brushing, or by applying with similar techniques from a suitable solvent for the polymer.

It is usually beneficial for as thin a coating or sheath as possible to be used. When both sides of the core are coated a coating thickness of 1 to 10 mils (0.025 to 0.025 mm.) per side is beneficially employed, and advantageously from 4 to 6 mils (0.1 to 0.15 mm.) is employed. When single-side coating is utilized, from 2 to 20 mils (0.05 to 0.5 mm.) can advantageously be used and preferably from 4 to 10 mils (0.1 to 0.25 mm.) is used.

Referring now to Figure 3, there is illustrated a partially joined carpet member, generally referred to by reference numeral 20, and a method for forming the integral carpet member 20 from individual carpet members 21 and 22 in accordance with the present invention. (When referring to carpet members herein it is to be understood that any type of conventional carpet structure is included such as tufted, woven and flocked). Carpet members 21 and 22 are comprised of a tufted carpet structure 23 having on the backside thereof and in intimate joined lamination therewith an olefin polymer of the type hereinbefore described.

Thus, one means for carrying out the method of the invention is to lay the carpet members 21 and 22 that are to be joined on a flat surface with the back of the carpet facing upwards. The adjacent edges of the members 21 and 22 are brought into contiguous relationship as much as practicable. Tape 10 is then placed over the adjacent edges and spaced evenly so that about equal overlay of tape 10 on members 21 and 22 is effected. Subsequently, a suitable heated flat surface is plyed over the top of tape 10 with adequate pressure until a permanent and secure bond is formed between tape 10 and carpet members 21 and 22 and continuous, integral carpet member 20 is produced.

In order to further illustrate the invention, two pieces of nylon tufted carpeting that had been extrusion coated on the backside thereof to a thickness of about 12 mils (0.3 mm.) with a copolymer of about 92 weight percent ethylene and about 8 weight percent ethyl acrylate were laid side-by-side with the polymer in backing facing upwards. The adjacent edges were pushed snugly together. A tape consisting of a thin, loosely woven core fabric about 2.7 inches (68 mm.) wide that had been extrusion coated on both sides from a molten polymer of similar composition to the carpet backing polymer was laid over the line of juncture of and equally spaced on the two carpet pieces. The polymer extended about 0.2 inch (5 mm.) beyond each side of the woven core of the tape. The total thickness of the tape was about 15 mils (0.375 mm.).

A sheet of regenerated cellulose was placed over the top of the tape and then a flat iron heated to about 350° F. (177° C.) was pressed

down over the regenerated cellulose-covered tape with medium hand pressure and forwarded along the full length of the juncture. Almost immediately thereafter the regenerated cellulose tape was readily stripped off and the carpet could be handled and installed as a single piece.

An excellent permanent joinder was obtained between the two carpet piece. When the carpet was laid on the floor in its normal fashion with the carpet face up, the joinder was not discernible through observation of any ridge, humps, puckers or the like.

WHAT WE CLAIM IS:—

1. Method for joining separate carpet members in an edge-to-edge relationship to form a unitary carpet structure, characterized in that a heat sealable tape having a layer of a polymer of a monoolefinic aliphatic olefin monomer having from 2 to 8 carbon atoms, is placed upon the back side and spanning the juncture of the carpet members and is subsequently bonded to the carpeting by the application of heat and pressure.

2. Method in accordance with Claim 1, characterised in that the polymer contains at least 50 weight percent of polymerised ethylene in the polymer molecule.

3. Method in accordance with Claim 2, characterised in that the tape has, in addition, a layer of reinforcing filaments.

4. Method in accordance with Claim 3, characterised in that the reinforcing filaments of the tape are encapsulated in the polymer.

5. Method in accordance with any one of Claims 1 to 4, characterised in that the tape has a release agent such as regenerated cellulose film on the side to which the heat and pressure are applied.

6. Method in accordance with any one of Claims 1 to 5, characterised in that the tape has a width of from 1/2 to 8 inches, and preferably from 3 to 4 inches.

7. Method in accordance with any one f Claims 2 to 6, characterised in that the carpet members have on the backside thereof a coating of a polymer of a monoolefinic aliphatic olefin monomer having from 2 to 8 carbon atoms, such as a polymer containing at least 50 weight percent polymerised ethylene in the polymer molecule.

8. Method in accordance with Claim 7, characterised in that the polymer on the carpet members is the same as the polymer on the tape.

9. Carpets comprising two or more individual carpet members which have been joined in edge-to-edge relationship by a tape bonded to the backside and spanning the juncture of the carpet members, the tape having a layer of a polymer of a mono olefinic aliphatic olefin monomer having from 2 to 8 carbon atoms and a layer of reinforcing filaments.

10. Method for joining separate carpet members in edge-to-edge relationship as claimed in Claim 1 substantially as described and illustrated with reference to the accompanying drawings.

11. Carpets comprising separate carpet members which have been joined in edge-to-edge relationship by the method of any one of Claims 1 to 8 or 10.

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979283 COMPLETE SPECIFICATION
1 SHEET This drawing is a reproduction of the Original on a reduced scale

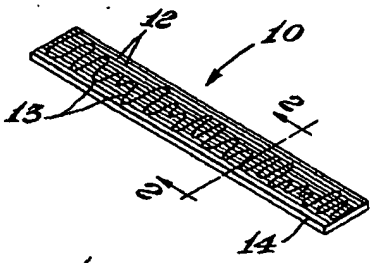

Fig. 1

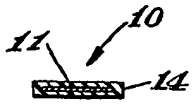

Fig. 2

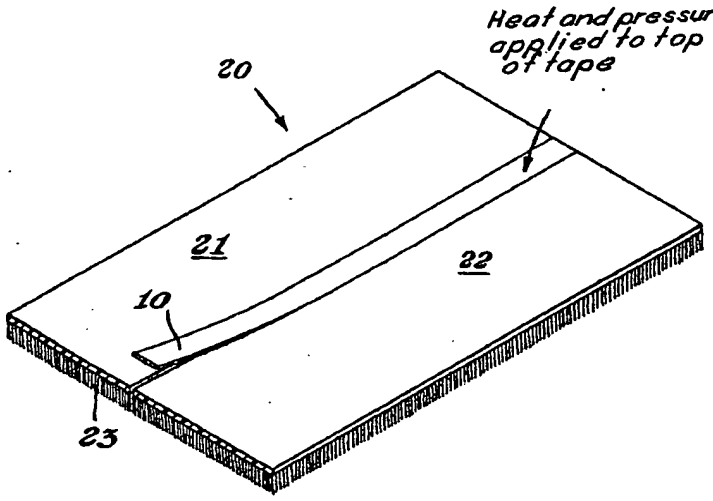

Fig. 3